SUPPORT AND SKIRTING SYSTEM FOR FACTORY BUILT STRUCTURES

Field of the Invention

[01] The present invention relates to factory built residential and commercial structures, and more particularly, to a system and its components for surrounding and securely supporting factory built residential and commercial buildings.

Background of the Invention

[02] Factory built residential and commercial buildings have become increasingly popular. As the cost of new construction rises, the relatively lower cost of factory built residential and commercial buildings has attracted many new buyers. Similarly, the design and use of these buildings has changed over the past years. These new designs and uses have made factory built buildings more aesthetically attractive to consumers. Factory built buildings are now widely used in place of traditionally-styled buildings including residential housing, office buildings, such as permanent and portable office buildings, classrooms and transportable hospitals.

[03] As used herein, the phrase "factory built buildings" includes, but is not limited to, permanent "traditionally styled" manufactured structures such as those mentioned above and other manufactured buildings or manufactured homes where the manufactured structure is trucked to the building site on flatbed trailers or the like. The phrase "factory built buildings" also encompasses structures that can be readily moved including transportable office buildings, hospitals and residential

housing commonly referred to as "trailer homes." Furthermore, modular structures including modular office buildings and modular homes are also encompassed by the term "factory built buildings" as sections of these structures are built at an offsite location, such as a factory, and then transported to a site for assembly as a unitary structure.

[04] Factory built buildings are traditionally built upon a frame containing two or more longitudinal members and/or several transverse beams that support the floors of the building. Support systems for these factory built buildings typically include concrete blocks or a plurality of support stands placed under the frame for supporting it and securing it to a type of foundation. Skirting, extending from the factory built building's rim joist to a point within the ground, is commonly used to secure and hide the foundation support system and provide a more aesthetic appearance. However, conventional foundation support and skirting systems may not provide adequate support to the factory built building in response to the lateral forces created by heavy winds, seismic activities or heavy snow. Unfortunately, those systems that may provide adequate support can be costly to produce and install. Additionally, these systems may be aesthetically unattractive. Further, when a cement foundation/footing is poured for aesthetic purposes, the poured concrete must be allowed to set at the job site, thereby delaying the assembly of the building at the job site.

[05] It is also difficult to back-fill soil against conventional skirting and supporting systems for factory built buildings. It is the ability to back-fill dirt and soil against the skirting that helps to give a factory built building the appearance of a

site built home. However, if the support assembly of the skirting and supporting system does not provide sufficient structural integrity to the skirting so that the skirting can withstand significant lateral loads, the skirting may fail during the back-filling process. More seriously, if either the skirting or support assembly fails, the factory built building may move during the back-filling process and/or support stands of the support assembly attached to the factory built building may begin to bend and fail before the factory built building is ever occupied. This would present significant dangers to the occupants of the factory built building.

[06] There is a decided need in the art for a skirting and supporting system useable with factory built buildings to effectively anchor the building during seismic activities, heavy winds, heavy snows and back-filling. The skirting and supporting system would provide support for the factory built building while presenting an aesthetically appealing appearance.

Summary of the Invention

[07] Aspects of the present invention relate to a system and its components for skirting and securely supporting a factory built building against lateral and vertical loads. Lateral loads experienced by the building can include those created by seismic activities, heavy winds, heavy snow and back-filling earth around the building. The components of the system allow the building to be easily and quickly assembled. The components are also aesthetically pleasing, while creating a protective and stable support system for the factory built building.

[08] In an embodiment, the system for supporting and skirting a factory built building includes a footing having an elongated channel extending in a direction that is substantially parallel to a longitudinal axis of said footing and a support assembly comprising a plurality of support members and a base. The base has a portion received within the channel of the footing. The system also includes a skirting panel positioned within the channel such that the portion of the base within the channel is positioned between the skirting panel and a sidewall of the channel. In at least one embodiment, the support assembly comprises a support stand including the support members. In these embodiments, the support members defining the support stand extend within a common vertical plane.

[09] According to another aspect of the invention, the system for supporting a factory built building comprises a footing having an elongated channel extending in a direction that is substantially parallel to a longitudinal axis of the footing. In this embodiment, the system also includes a support assembly comprising a plurality of support members and a base having a portion received within the channel of the footing. This embodiment further includes a skirting panel positioned within the channel such that the portion of the base within the footing channel is positioned between the skirting panel and a sidewall of the channel.

Brief Description of the Figures

[10] Figure 1 illustrates a skirting and supporting system according to the present invention;

[11] Figure 2 illustrates a support assembly shown in Figure 1;

[12] Figure 3 illustrates a footing shown in Figures 1 and 2;

[13] Figure 4 is an end view of the footing shown in Figure 3;

[14] Figure 5 illustrates a support stand shown in Figure 2;

[15] Figures 6 and 7 are side views of alternative embodiments of the support stand shown in Figure 5;

[16] Figures 8 and 9 are end views of alternative embodiments of a support base shown in Figure 2;

[17] Figure 10 illustrates cooperating ends of adjacent skirting panels supported by the support assembly of Figure 2;

[18] Figure 10A is an enlarged portion of the cooperating ends of Figure 10;

[19] Figure 10B is a top view of an alternative embodiment of cooperating adjacent skirting panels supported by the support assembly of Figure 2;

[20] Figures 11A and 11B are side views of an assembly for connecting the support assembly of Figure 2 to a factory built building; and

[21] Figure 11C illustrates an alternative assembly connecting the support assembly of Figure 2 to a factory built building in a manner similar to that shown in Figure 11B.

Detailed Description of the Figures

[22] As shown in Figure 1, an aspect of the present invention relates to a skirting and supporting system 10 for factory built buildings such as those discussed above. For ease of explanation, the discussion of this aspect of the present invention will relate to two types of factory built buildings, manufactured homes and modular homes. However, this discussion does not prevent the application of the skirting and supporting system 10 to other types of factory built buildings. The skirting and supporting system 10 can be used with any type of factory built building, as discussed above.

[23] The skirting and support system 10 comprises a perimeter support assembly 50 and a skirting assembly 300. The support assembly 50 includes at least one support stand 210 and at least one perimeter load bearing footing 100 as shown in Figure 2. The skirting assembly 300 includes at least one elongated skirting panel 310.

[24] The number and/or size of support stands 210 and footings 100, as well as the linear feet of the skirting panels 310, can differ from building to building depending on the length of the building, weight of the building and/or the lateral loads that will be experienced by the building. For example, the greater the lateral forces that will be experienced by the building, the more support stands 210 and footings 100 that may be installed to support the base of the factory built building.

[25] Figure 2 shows the support assembly 50 including the support stand 210 and the perimeter load bearing footing 100. Each footing 100 for the system 10 is cast

and cured prior to being delivered to a job site. The footings 100 do not require onsite curing. As a result, the footings 100 reduce the time needed to assemble the factory built building because, upon arrival, the footings 100 are ready to be installed and receive the lateral and vertical loads experienced by the factory built building when installed. As can be readily understood, the loads experienced by the perimeter of the factory built building will be transferred to the footings 100 by the support stands 210.

[26] As shown in Figure 3, each footing 100 of the illustrated embodiment has an elongated channel 120 extending along the length of the footing 100 between terminal ends 109. The channel 120 receives a portion of the skirting panel 310 and support member 210 as shown in Figure 1. In operation, the elongated channel 120 positions the support member 210 for the proper and most effective transfer of loads from the exterior of the factory built building to the footing 100, as discussed below. The elongated channel 120 also aligns adjacent skirting panels 310 along the length of the factory built building that they abut.

[27] The elongated channel 120 is spaced from the sloped sidewalls 112, 114 of the footing 100 such that the channel 120 is offset from the longitudinal center of the footing 100. As illustrated in Figure 4, the center of the elongated channel 120 is spaced a greater distance from the inner sidewall 112 than from the outer sidewall 114. The greater distance from the inner sidewall 112 to the center of the channel 120 permits the portion of the footing 100 that will be closer to the center of the factory built building to have more surface area, more volume and greater weight than the portion on the opposite side of the channel 120 in order to better receive

and distribute the forces applied to the footing 100 by the support stand 210 and the skirting panels 310. As used herein, the terms "inner" and "outer" are used to describe the position of sidewalls 112, 114 of the footing 100 relative to the center and outer walls of the supported building. These terms do not limit the use of the footings 100 to only those instances in which the sidewall 112 is closer to the center of the factory built building than the sidewall 114. It is also contemplated that in certain embodiments, the sidewall 114 can be positioned closer to the center of the building than sidewall 112.

[28] In Figure 4, it is seen that the channel 120 has a base 127 extending substantially parallel to the upper surfaces 116 of the footing 100. However, sidewalls 128, 129 that define the vertically extending portion of the channel 120 are not parallel to each other. Instead, the sidewalls 128, 129 extend at an angle to each other so that the width (A) of the upper opening 122 of the channel 120 that extends in a direction between the sidewalls 112, 114 is greater than the width (B) of the base 127 of the channel 120. By these sidewalls 118, 119 of the channel not being parallel to each other, the channel 120 posses a tolerance between its upper and lower limits that permits the skirting panel 310 to move in response to lateral forces without binding the skirting panel 100 and causing it to fail. The amount of tolerance can vary with the width and height of the skirting panels 310.

[29] Figure 3 illustrates a wedge slot 130 extending within the footing 100 substantially transverse to the length of the channel 120. The wedge slot 130 extends between the outwardly sloped, lateral sidewalls 112, 114 of the footing 100. In an alternative embodiment, the wedge slot 130 can extend at an angle

greater than 90° relative to the length of the channel 120. In operation, a wedge 150 (Figure 1) can be introduced into the wedge slot 130 to support the ends of adjacent skirting panels 310 and position the adjacent panels 310 at the proper height and angle relative to the factory built building. At least one wedge 150 can be introduced into channel 120 at the open terminal ends 109 to support and vertically level the ends of the skirting panels 310 extending within the channel 120.

[30] As shown in Figure 3, the portions of the footing 100 on either side of the wedge slot 130 have a substantially trapezoidal shaped cross section. This shape permits the footings 100 to be formed of the minimum amount of concrete needed to accept the cone of influence of a load(s) applied to the footing by the support stand 210. By being shaped and sized to receive the wide base of the cone of influence for any point load experienced by the support stand 210, extra, unnecessary concrete is not used in the footing 100. This helps to keep the price of the footings down without jeopardizing the ability of the footing 100 and support stand 210 to safely receive and disperse the loads experienced by the support stands 210. As understood, the overall size and specific dimensions of one or more of the footings 100 can be changed if the size (magnitude) of the cone of influence created by the load(s) on a respective support stand 210 is greater than those of a different portion of the same building or a different building.

[31] The footings 100 can include one or more lengths of rebar 135. In an embodiment, the rebar 135 extends through the footing 100 in horizontal and/or

vertical planes. The rebar 135 could take the form of individual lengths extending parallel or at an angle to the length of the footing 100 and channel 120. In an alternative embodiment, the rebar 135 forms a rectangular shape, a U-shaped or X-shaped orientation within the footing 100.

[32] Figure 4 illustrates an angled passage 145 extending through the outer sidewall 114 and the base 118. The passage 145 has a drive anchor hole 146 and a support collar 147 along the sidewall 114. The support collar 147 can be formed as part of the sidewall 114 or added as a separate element. A drive anchor rod (not shown) for securing the footing 100 to the ground is advanced through the hole 146 and the passage 145 until it penetrates the ground below the footing 100. In an embodiment, the rod extends at least two feet into the ground below the base 118 of the footing 100. The passage 145 extends at an angle of about 65 degrees to the base 118 of the footing 100. In the illustrated embodiment, the angle delivers the passage 145 to a point lying substantially at the center of the footing 100 without the passage 145 entering the channel 120. Other angles that allow the passage 145 to extend from the sidewall 114 to an appropriate point of the base can also be used.

[33] The footing 100 supports the support stand 210 that is securely connected to the factory built building and that assists in keeping the skirting panels 310 in their upright position as shown in Figure 1. In the embodiment illustrated in Figures 2 and 5, the support stand 210 includes a pair of support members 215 that extend upwardly from a base 220 to a bushing 230 that is part of a connection assembly for the factory built building. The support stand 210 and its associated base 220

transfer lateral and vertical loads from the perimeter of the factory built building to the footing 100 and along the dimensions of the secured footing 100.

[34] The support members 215 can be formed of angle steel or channel steel with the openings of the angle or channel steel opposing each other as shown in Figure 5. This orientation of the support members 215 can provide additional strength to the support stand 210 for resisting lateral loads. In an alternative embodiment, the support members 215 are formed of steel tubes. The support members 215 extend in opposite directions from each other while occupying the same vertically extending plane (Figure 1) and extending substantially parallel to the length of the building along which they are placed. This allows the support members 215 to be positioned at the same lateral distance from the factory built building. When the support members 215 are positioned parallel to their respective length of the factory built building, the support stand 210 will be free of a support member 215 that extends perpendicular to, or at another angle to, the factory built building. As a result, the support stand 210 can be positioned immediately proximate the factory built building without the position of a support member dictating the position of the support stand 210 relative to the factory built building. This permits the crew assembling the building on site to position the support stand 210 in the most advantageous position for the building it is intended to support.

[35] An alternative embodiment of the support stand 210 is shown in Figure 6. In this embodiment, the support members 215 can form the shape of an A or a triangle having a vertically positioned cross brace 219. In an additional alternative embodiment, the support members 215 can include more than two support

members 215 that together form the shape of a pyramid. For example, as illustrated in Figure 7, the support stand 210 can include a center supporting vertically extending member 216 that carries the bushing 230. This embodiment of the support stand also includes opposing support members 217 that extend outwardly from a point along the vertical length of the supporting member 216 to the base 220. As with support members 215, support members 217 occupy the same vertical plane and extend substantially parallel to the length of the factory built building they support.

[36] In any of the above-discussed embodiments, the support members 215 are welded to the base 220 and the bushing 230. However, other known ways for securing the support members 215, 216, 217, the support base 220 and the bushing 230 together as a support assembly 210 could also be used.

[37] The bushing 230 is located at an upper, vertical end of the support stand 210. The bushing 230 receives a threaded rod 240 that can adjust the distance between the footing 100 and the frame of the factory built building. The rod 240 has an upper end 241 that carries a seating device 242 (Figures 11A-11C). In one embodiment illustrated in Figures 5 and 11C, the seating device 242 includes an L-shaped bracket 243 that mates with and is secured to the under frame of the factory built building by a known fastener or connector 246 as is known. Alternatively, the seating device 242 includes a U-shaped saddle jack 245 for mating with a floor joist of the factory built building as is known (Figures 11A and 11B). Any other known member 246 for connecting a support to the frame of a factory built building could also be used at the upper, terminal end 241 of the rod 240.

[38] The threaded rod 240 includes an engagement member 247, such as a nut, that can be engaged in order to move the rod 240 relative to the bushing 230. Other known members that can be engaged and moved in order to rotate the threaded rod 240 can also be used. In the illustrated embodiment, as the movement of the engagement member 247 causes the threaded rod 240 to rotate relative to the support stand 210 and the bushing 230, the height of the supported building is leveled so that the base of the building occupies the same horizontal plane. In one embodiment, the threaded rod 240 has a total moveable distance of about 2.5 inches. However, the threaded rod 240 can have a total moveable distance that is greater or less than 2.5 inches. Also, the rod 240 can occupy an infinite number of positions along its total moveable length.

[39] The base 220, illustrated in Figure 2, transfers the loads from the factory built building to the footing 100. In one illustrated embodiment, the base 220 has a substantially L-shaped cross section. In this embodiment, the base 220 can be formed of angle steel, angle iron or other known angle shaped materials that are capable of transferring the loads experienced by a factory built building to the footings 100. The L-shaped base 220 includes a first portion 221 that extends into the channel 120 of the footing 100 and a second portion 222 that extends transverse to the first portion 221 and over a rearwardly extending upper surface 102 of the footing 100.

[40] In an alternative embodiment illustrated in Figure 8, the base 220 has a substantially U-shaped cross section and can be formed of a channel steel, channel iron or other known channel shaped materials that are capable of

transferring the loads experienced by the factory built building to the footings 100. In this embodiment, the first portion 223 and second portion 224 of the base 220 extend as discussed above with respect to the embodiment shown in Figure 2. A third portion 225 of the base 220 extends at an angle over the sidewall 114 of the footing 100 to aid in the retention of the support stand 210 in the elongated channel 120 of the footing 100.

[41] In yet another embodiment, illustrated in Figure 9, the base 220 has a substantially T-shaped cross section and is made of the same materials discussed above. In this embodiment, the arms 226, 227 of the T extend vertically and substantially parallel to the support members 215. The upper arm 227 can be secured to the support members 215 by welding or other known securing techniques to add strength to the support member 215. The leg 228 of the base 220 shown in Figure 9 will extend over the rear upper surface 116 of the footing 100 in the same manner as portion 222 shown in Figure 2.

[42] The skirting panels 310 shown in Figure 1 are precast and cured before being transported to the installation site for the factory built building. The skirting panels 310 can be preformed of a lightweight concrete that results in a skirting panel with the external appearance of a poured concrete stem wall. However, unlike a poured concrete wall, the skirting panels 310 do not require time at the installation site to set up and cure. Hence, unlike poured walls, the skirting panels 310 do not delay the installation of the factory built building at the site.

[43] The precast cement skirting panels 310 can be easily painted or otherwise decorated to change their outwardly visible aesthetic appearance. Additionally, the precast cement skirting panels 310 provide protection to the support assembly 50 and the factory built building by resisting rotting and damage experienced by conventional skirting panels at the hands of insects and/or vermin. When positioned within the channel 120 of the footing 100 and against the support stand 210, thermal retention properties of the skirting panels 310 provide temperature insulation to the supporting assembly 50 and the factory built building. The skirting panels 210 also protect the support assembly 50 and the underside of the factory built building from heat and fire damage that could result from fires in the vicinity of the exterior of the factory built building.

[44] As illustrated in Figure 1, the skirting panels 310 have a shape that is similar to that of other conventional panels such as plywood. The thickness of the skirting panels 310 is less than the length and height of the skirting panel 310. For installation, the skirting panels 310 can be cut like plywood to easily size it for meeting the lengths of factory built building. The skirting panels 310 can be cut to size by a conventional masonry saw. Terminal ends 315 of the skirting panels 310 can be shaped so that the ends of adjacent panels compliment and overlap each other as shown in Figure 10. In such an embodiment, opposite ends 315 of the same panel may have different shapes or angles that allow them to compliment the end 315 of an adjacent panel 310. Alternatively, opposite ends 315 of the same panel 310 may be formed with the same angle. In such an embodiment, adjacent panels 310 would have different shaped ends 315. In an

embodiment, one end 315 of a panel 310 may be cut at an angle of about 101 degrees and the other end 315 of the immediately adjacent and cooperating panel can be cut at an angle of about 79 degrees. In such an embodiment, the angled ends 315 will overlap each other, appear to be substantially seamless and eliminate any direct passageway through the joint between the adjacent skirting panels 310. In an alternative embodiment, the ends 315 of adjacent skirting panels may be spaced to allow light to enter below the building. In any of the discussed embodiments, a conventional sealing compound could be applied over the cooperating ends 315 of adjacent skirting panels 310.

[45] In another aspect of the present invention, the support system 10 can be secured to the factory built building and function as a tie-down system. By securely attaching the support system 10 to the factory built building, the entire weight of the support system 10 is added to the weight of the factory built building. As a result, the factory built building's resistance to damage from high winds is increased.

[46] In this embodiment, the support system 10 is attached to the factory built building when the seating device 242 is securely attached to the building at the rim joist or other known attachment point; the support members 215 holding the seating device 242 are secured to the base 220; and the base 220 is secured to the footing 100 either by friction or a connecting member such as a bolt, pin or screw. The seating device 242 can be secured to the support members 215 by placing a threaded engagement/holding member 247 on both sides of the bushing 230. In an embodiment, the lower engagement/holding member 247 is positioned on the

bottom of the threaded rod 240 and tightened upward toward the supported building after the height and support of the stand 210 are set by proper adjustment of the engagement/holding member 247 above the bushing 230.

[47] In any of the above embodiments, the support stands 210 can be secured to their respective footing 100 by positioning two or more elongated members, such as bolts, rods or pins, through holes in the portion of the base 220 overlapping a portion of the footing 100 and threaded inserts imbedded in the load-bearing surface of the footing 100 during footing construction.

[48] Effectively attaching the footings 100, support stands 210 and skirting panels 300 to the building adds the following to the effective weight of the structure: (1) The entire weight of the system 10 (since the footing 100 holds the weight of the concrete skirting panels 300 and the support stands 210); (2) the weight equivalent of the force necessary to pull-out the securing rods from within the imbedded inserts in the footings; and (3) the weight of the back-filled material that extends over the footings 100.

[49] Numerous characteristics, advantages and embodiments of the invention have been described in detail in the foregoing description with reference to the accompanying drawings. However, the disclosure is illustrative only and the invention is not limited to the illustrated embodiments. It will be apparent to persons ordinarily skilled in the art that modifications may be made thereof within the scope of the invention, which scope is to be accorded the broadest interpretation of the claims such as to encompass all equivalents, devices, and

methods. Therefore, various changes and modifications may be effected therein by one skilled in the art without departing from the scope or spirit of the invention. For example, the footings 100 may be secured in position with the previously mentioned securing rods, or by using a known geogrid-type material. Additionally, the panels 310 could be positioned within the channels 120 of the footings 100 without the support stand 210. In such an embodiment, an alternative support device, such as a metal plate, angle steel or wedge may be positioned within the channel 120 behind the panels 310 to support the panels 310, and in some embodiments, also the building, when in their vertical positions.